Practice Set for Exam 2, Math 9

1. Find the Maclaurin series of $\ln(1+x)$. What is its radius of convergence? You must justify your answers.

2. Use the Maclaurin series of e^x and the fact that $e < 3$ to evaluate $e = e^1$ with an error smaller than 0.01.

3. Use the fact that the Maclaurin series for e^x is
$$\sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$
to find the Maclaurin series for $\dfrac{e^x + e^{-x}}{2}$.

4. The two points $A(1,2,3)$ and $B(0,-1,1)$ determine a line, L. Find
   (a) The vector equation of L.
   (b) The parametric equations of L.
   (c) The symmetric equations of L.

5. Given the line L with vector equation $\mathbf{r}(t) =< t,t,t >$ and the point $P(0,0,1)$, find a line through P which intersects the line L and is perpendicular to L.

6. Let $\mathbf{u}(t) = \langle u_1(t), u_2(t), u_3(t)\rangle$ and $\mathbf{v}(t) = \langle v_1(t), v_2(t), v_3(t)\rangle$ be differentiable vector-valued functions. Prove that $\frac{d}{dt}\big(\mathbf{u}\cdot\mathbf{v}\big) = \mathbf{u}'\cdot\mathbf{v} + \mathbf{u}\cdot\mathbf{v}'$.

7. Let $\mathbf{v} =< 1,2,-3 >$ and $\mathbf{w} =< 3,5,10 >$. Find the vector projection of $\mathbf{v}$ onto $\mathbf{w}$.

8. Find the angle between a diagonal of a cube and one of its edges.

9. Fine the volume of the parallelepiped determined by the vectors
$$\mathbf{v} =< 1,3,0 >,\ \mathbf{w} =< 7,1,2 >,\ \text{and}\ \mathbf{u} =< 0,2,5 > .$$

10. Find the following limit knowing that it exists
$$\lim_{(x,y)\to(0,0)} \frac{x^2+y^2+x^2y^2}{x^2+y^2}.$$